

CLAIMS

1 1. An apparatus for electroless spray deposition of a metal layer on a substrate, comprising:

2 a processing chamber to hold at least one substrate on which the metal layer is to be  
3 deposited, the processing chamber including at least one section movable between an open  
4 position to allow the at least one substrate to be introduced into and removed from the  
5 processing chamber and a closed position to seal the processing chamber to allow for  
6 pressurization of the processing chamber;

7 an inlet to provide pressurizing gas to the processing chamber;

8 an exhaust line to exhaust pressurizing gas from the processing chamber;

9 a pressure regulator to regulate pressure within the processing chamber;

10 a sprayer provided within the processing chamber to spray an electroless plating  
11 solution onto the at least one substrate; and

12 a drain provided in the processing chamber to drain the electroless plating solution  
13 from the processing chamber.

1 2. The apparatus according to claim 1, wherein the processing chamber includes a  
2 chamber body and a stationary cover and wherein the chamber body is movable between the  
3 open position and the closed position.

1 3. The apparatus according to claim 2, wherein the chamber body has a cylindrical shape  
2 and, in the closed position, the chamber body is sealed to the stationary cover by an o-ring.

1 4. The apparatus according to claim 1, wherein the processing chamber includes a  
2 chamber body and a cover and wherein the cover is movable between the open position and  
3 the closed position.

1 5. The apparatus according to claim 4, wherein the chamber body has a cylindrical shape  
2 and, in the closed position, the cover is sealed to the chamber body by an o-ring.

1 6. The apparatus according to claim 1, wherein the sprayer is a spray bar.

1 7. The apparatus according to claim 1, further comprising a first reservoir to contain a  
2 metal stock solution comprising a solution of the metal to be deposited; a second reservoir to  
3 contain a reducing solution; the metal stock solution and reducing solution, when mixed in  
4 predetermined proportions forming the electroless plating solution; a mixing chamber for  
5 mixing the metal stock solution and the reducing solution to thereby provide the electroless  
6 plating solution; first and second lines, respectively connecting the first and second reservoirs  
7 to the mixing chamber, the first and second lines including respective first and second  
8 controllable valves to provide predetermined quantities of the solutions in the respective  
9 reservoirs to the mixing chamber at selected times; and a supply line connecting the mixing  
10 chamber and the sprayer so as to allow for delivery of said electroless plating solution to the  
11 sprayer.

1 8. The apparatus according to claim 7, further comprising a heater to heat solution in at  
2 least one of the first reservoir, the second reservoir, the mixing chamber, the first and second  
3 lines and the supply line.

1 9. The apparatus according to claim 1, wherein the pressure regulator includes a shutter  
2 provided in the exhaust line and a valve provided in the drain.

1 10. The apparatus according to claim 1, wherein the processing chamber includes a  
2 rotatable chuck on which the substrate is to be held.

1 11. The apparatus according to claim 10, further comprising a passage in the chuck for

2 allowing flow of a fluid to the back of the substrate to be held on the chuck.

1 12. The apparatus according to claim 10, further comprising an additional sprayer  
2 provided within the processing chamber adjacent an outer portion of the chuck to spray a fluid  
3 onto an edge of the at least one substrate.

1 13. The apparatus according to claim 7, further comprising at least one additional  
2 reservoir to contain at least one fluid selected from the group consisting of a pre-cleaning  
3 fluid, a pre-wetting fluid, ultra-pure water, deionized water, and a post-cleaning fluid.

1 14. An apparatus for electroless spray deposition of a metal layer on a substrate,  
2 comprising:  
3 a processing chamber to hold at least one substrate on which the metal layer is to be  
4 deposited, the processing chamber including at least one section movable between an open  
5 position to allow the at least one substrate to be introduced into and removed from the  
6 processing chamber and a closed position to seal the processing chamber to allow for  
7 pressurization of the processing chamber;

8 means for pressurizing the processing chamber;

9 means for regulating pressure within the processing chamber; and

10 means for spraying an electroless plating solution onto the at least one substrate.

1 15. The apparatus according to claim 14, further comprising means for heating the  
2 electroless plating solution.

1 16. A method for electroless spray deposition of a metal layer on a substrate, comprising:  
2 providing at least one substrate on which the metal layer is to be deposited in a  
3 processing chamber;

4 sealing the processing chamber in which the at least one substrate is provided;  
5 pressurizing the processing chamber;  
6 regulating pressure within the processing chamber; and  
7 spraying an electroless plating solution onto the at least one substrate.

1 17. The method according to claim 16, further comprising heating the electroless plating  
2 solution.

1 18. The method according to claim 16, wherein the at least one substrate includes a layer  
2 containing copper provided thereon and the electroless plating solution includes cobalt.

1 19. The method according to claim 16, further comprising mixing a metal stock solution  
2 and a reducing solution to provide the electroless plating solution in a mixing chamber  
3 connected by a supply line to a sprayer in the processing chamber.

1 20. The method according to claim 16, further comprising flowing a fluid onto a back  
2 surface of the at least one substrate to prevent exposure of the back surface of the at least one  
3 substrate to the electroless plating solution.

1 21. The method according to claim 20, wherein the fluid is selected from the group  
2 consisting of inert gas and water.

1 22. The method according to claim 21, further comprising heating the fluid to control a  
2 temperature of the at least one substrate.

1 23. The method according to claim 20, further comprising heating the fluid to control a  
2 temperature of the at least one substrate.

1 24. The method according to claim 16, further comprising pre-cleaning and/or pre-wetting  
2 the at least one substrate in the processing chamber before spraying the electroless plating

3 solution onto the at least one substrate.

1 25. The method according to claim 16, further comprising pre-cleaning and/or pre-wetting  
2 the at least one substrate in the processing chamber before pressurizing the processing  
3 chamber.

1 26. The method according to claim 16, further comprising post-cleaning the at least one  
2 substrate in the processing chamber after spraying the electroless plating solution onto the at  
3 least one substrate.

1 27. The method according to claim 16, further comprising annealing the at least one  
2 substrate in the processing chamber after spraying the electroless plating solution onto the at  
3 least one substrate.